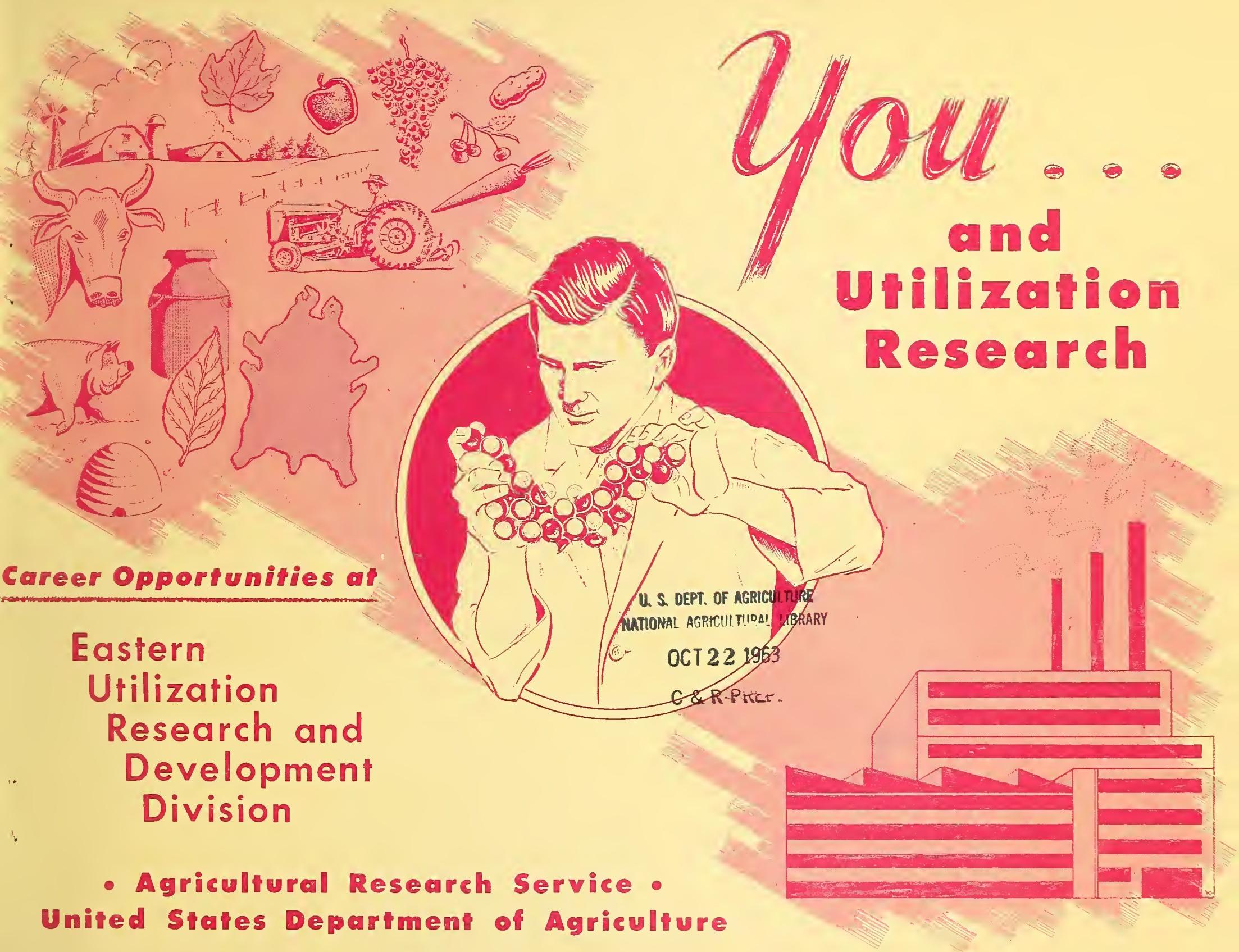


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# You . . . and Utilization Research





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You . . .



and Utilization Research

# A Message from Our Director . . .



The U.S. Department of Agriculture, of which we are a part, has made its mark in the field of science. Since its organization over 100 years ago, the Department has pioneered in agricultural research, and its achievements have played a vital role in making American farms the most productive in the world. From these phenomenal advances in farm productivity has arisen the need for a new kind of research—utilization research. This is similar to the research industries engage in to increase their markets. Science has taught us how, in the famous words of Isaac Newton, our first Commissioner of Agriculture, "to make two blades of grass grow where but one grew before." In utilization research, we seek a profitable use for both of these blades.

Our job at the Eastern Division is to find new and wider uses and more efficient processing methods for a variety of agricultural commodities, including dairy products, meat, animal fats, leather, fruits and vegetables, tobacco, maple sirup, and honey. The work covers a wide gamut of scientific inquiry from fundamental research in protein, carbohydrate, and fat chemistry to technological investigations in connection with pilot-plant operations. As such, it demands the best talents of chemists, chemical engineers, microbiologists, food technologists, and a number of other specialists in related fields.

If you have training in one of these fields and are interested in the fascinating work of our laboratories outlined in this booklet, contact us. I would like to meet you!

P. A. Wells

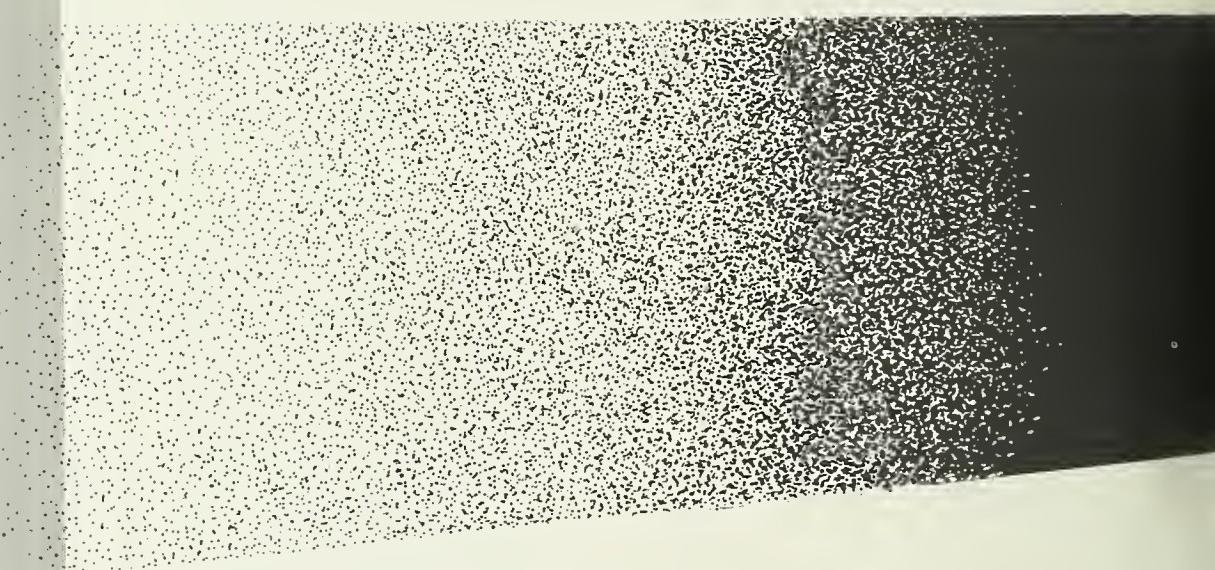


The Eastern Regional Research Laboratory, headquarters of the Eastern Division, dominates a beautifully landscaped, 32-acre "campus" in the quiet Philadelphia suburb of Wyndmoor, Pa. Other laboratories of the Division are located in Washington, D.C., and Beltsville, Md.

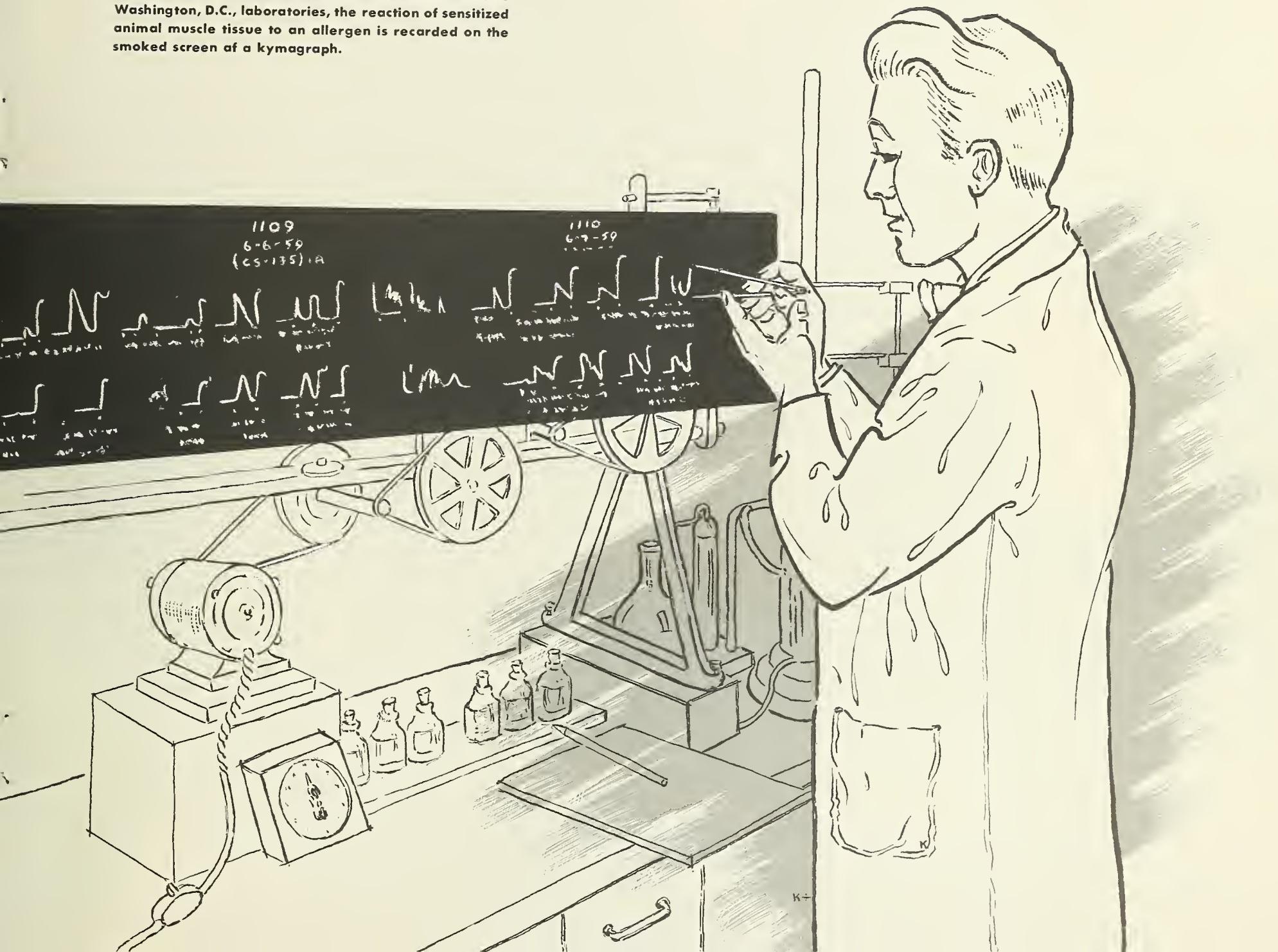
## **Y**ou will find utilization

research a stimulating area of agricultural science. It serves agriculture, and hence the general welfare, by establishing wider markets for farm-grown raw materials through the development of new and improved products and processes. The program is well balanced, with strong emphasis on basic research in the physical and biological sciences and energetic application of research findings in the laboratory, in the pilot plant, and in industry.

Workers at the Eastern Utilization Research and Development Division are pursuing rewarding careers. They are establishing enviable scientific reputations for themselves, while at the same time they are serving their country by contributing to the solution of one of its most vexing problems—agricultural surpluses.



As part of a study of the allergens of agricultural products, which is pursued in one of the Eastern Division's Washington, D.C., laboratories, the reaction of sensitized animal muscle tissue to an allergen is recorded on the smoked screen of a kymograph.



# Opportunities . . .

The exploration of a new and dynamic area of science like utilization research affords exceptional career opportunities. The Eastern Division's broad program of basic and applied research in the physical and life sciences and in engineering development is constantly challenging individuals of differing interests, capabilities, and experience. It provides a stimulating atmosphere and many opportunities to gain professional advancement and to associate freely with scientists whose achievements are known throughout the world.



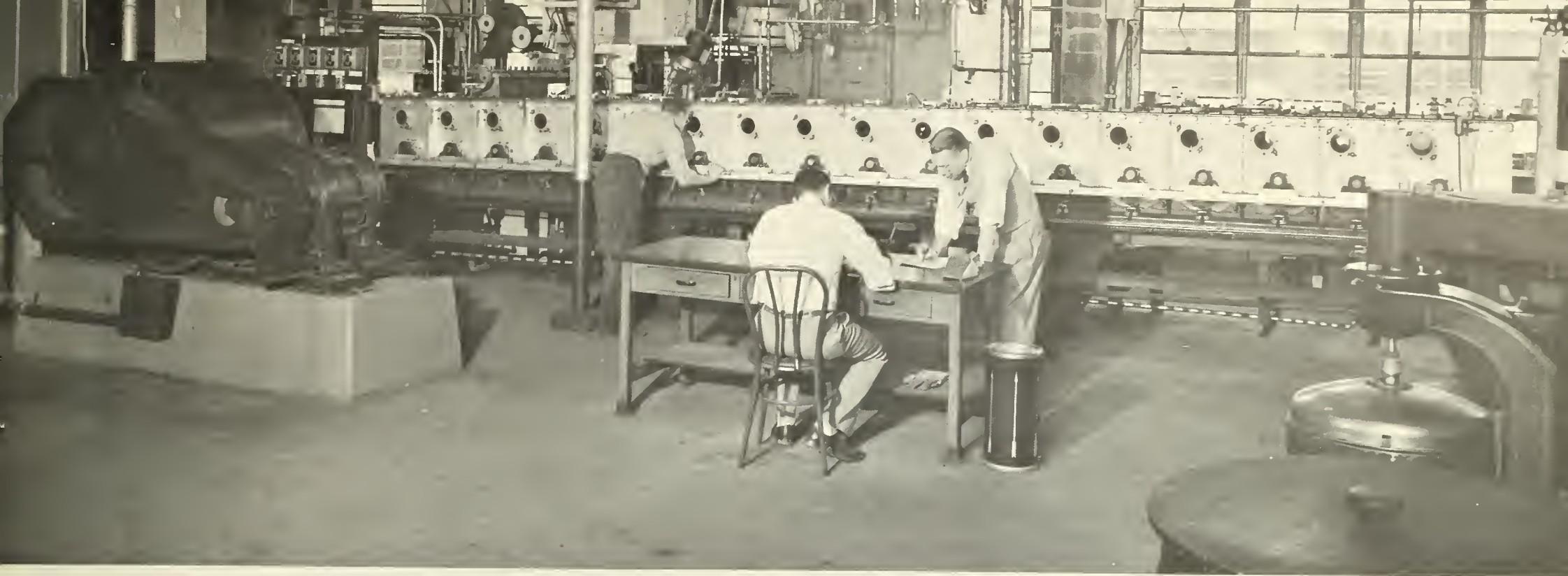
## A Stimulating Atmosphere

The administrators of our program are themselves scientists. They are aware of the conditions that must prevail to permit research people to do their best work. Hence they have created an environment combining the most desirable features of academic and industrial research. This is the environment that stimulates rapid professional growth and leads to early professional recognition.

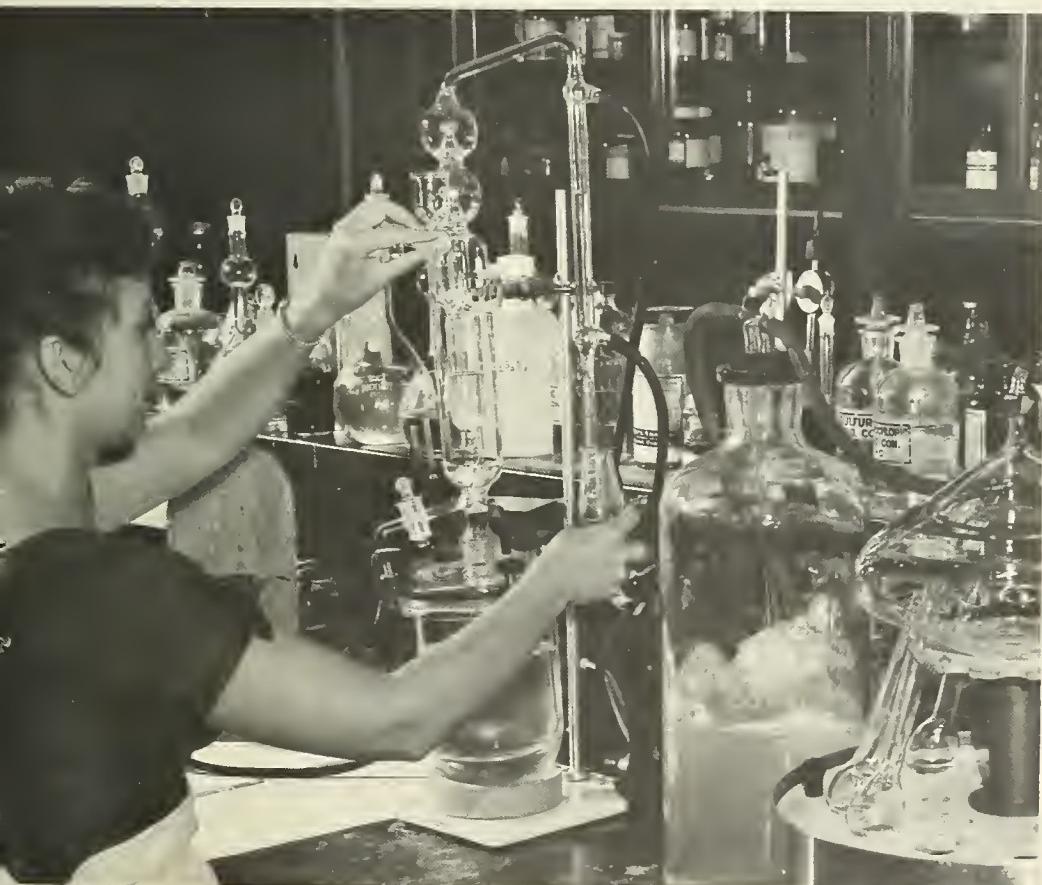
Basic research is strongly emphasized throughout the Agricultural Research Service. In the Eastern Division the fundamental aspects of the research program are investigated fully. In addition, the Division contains two pioneering research laboratories—small groups of scientists who conduct basic studies exclusively.

One of the keys to the Eastern Division's success as a research organization is its respect for the individual scientist. Within the framework provided by the commodities assigned to the Division, the qualified scientist is free to develop his own ideas. He surveys the problems to be solved and the best methods of solving them, usually in coordination with other specialists pursuing related investigations.

Automatic fraction collector is used for chromatographic analysis of amino acids in collagen and other hide components.



Continuous countercurrent equipment is used for extracting agricultural products on semiworks scale.



Micraanalysis for nitrogen is one of many procedures used to determine the composition of agricultural commodities.

Hence the creativity of the individual scientist is encouraged in the Eastern Division. Broad scope is allowed to individual abilities and interests. As the scientist demonstrates his capacity to assume independent responsibility, he receives increasingly challenging assignments with corresponding salary advances. And these advances do not necessarily depend on administrative responsibilities; indeed a scientist in the Agricultural Research Service may receive a higher salary than his administrative supervisor.

Professional development is fostered by informal and easy association with staff scientists who have gained worldwide recognition. Rank or title is no barrier to the exchange of ideas and information in this flexible and congenial organization. Staff members are also encouraged to visit and maintain contact with the leaders of other research institutions and industrial laboratories at home and abroad.

These intangibles that go to make up a stimulating atmosphere are stressed at the Eastern Division, but they are not offered as a substitute for the services and equipment needed for productive research. Available to the entire scientific staff are well-trained research assistants, the best modern equipment, and technical supporting services of the highest caliber.

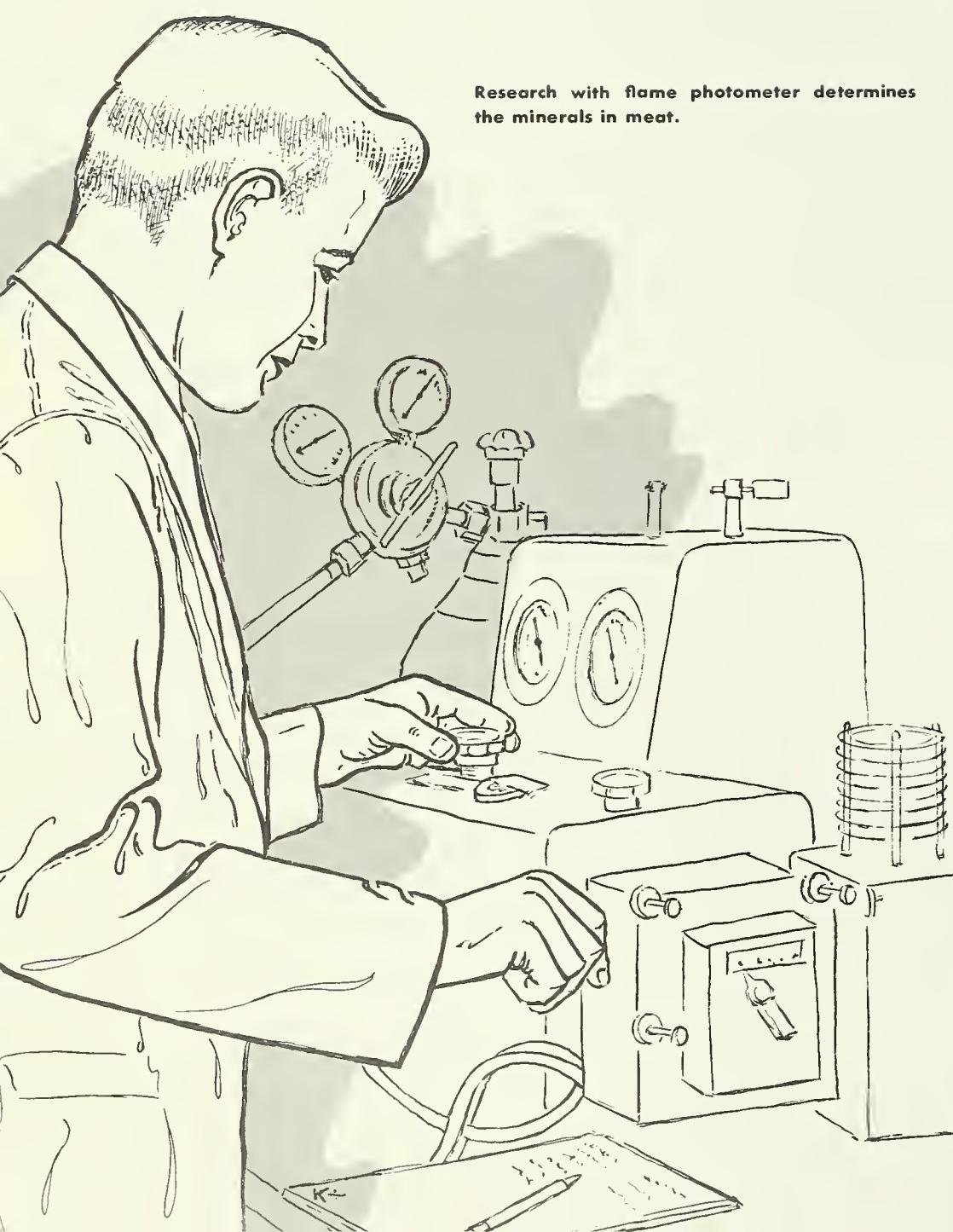
## Professional Recognition

The possibilities for the young scientist to increase his professional stature are virtually boundless in the Eastern Division. Frequent seminars are held, and staff members participate widely in colloquia held at local universities and research institutions. Specialized training at Government expense is available to staff members at full salary. Through fellowships or exchange arrangements, outstanding researchers may spend as much as a year in advanced study, either in the United States or abroad. Staff scientists are encouraged to participate in the affairs of scientific and professional societies, and a number hold positions of leadership in them.

Publication of research results is not only permitted, but encouraged and expected. No research project is considered complete until the results have appeared in professional scientific journals or in appropriate publications of the U.S. Department of Agriculture. Staff members can be sure of gaining a reputation for their work among their colleagues through publication and also through the presentation of their papers at meetings of scientific societies. The literature now contains almost 2000 publications of the Eastern Division scientists.

## Awards

Outstanding research accomplishments or sustained technical excellence may be rewarded in many ways. The U.S. Department of Agriculture makes awards annually to groups and individuals for meritorious



Research with flame photometer determines the minerals in meat.

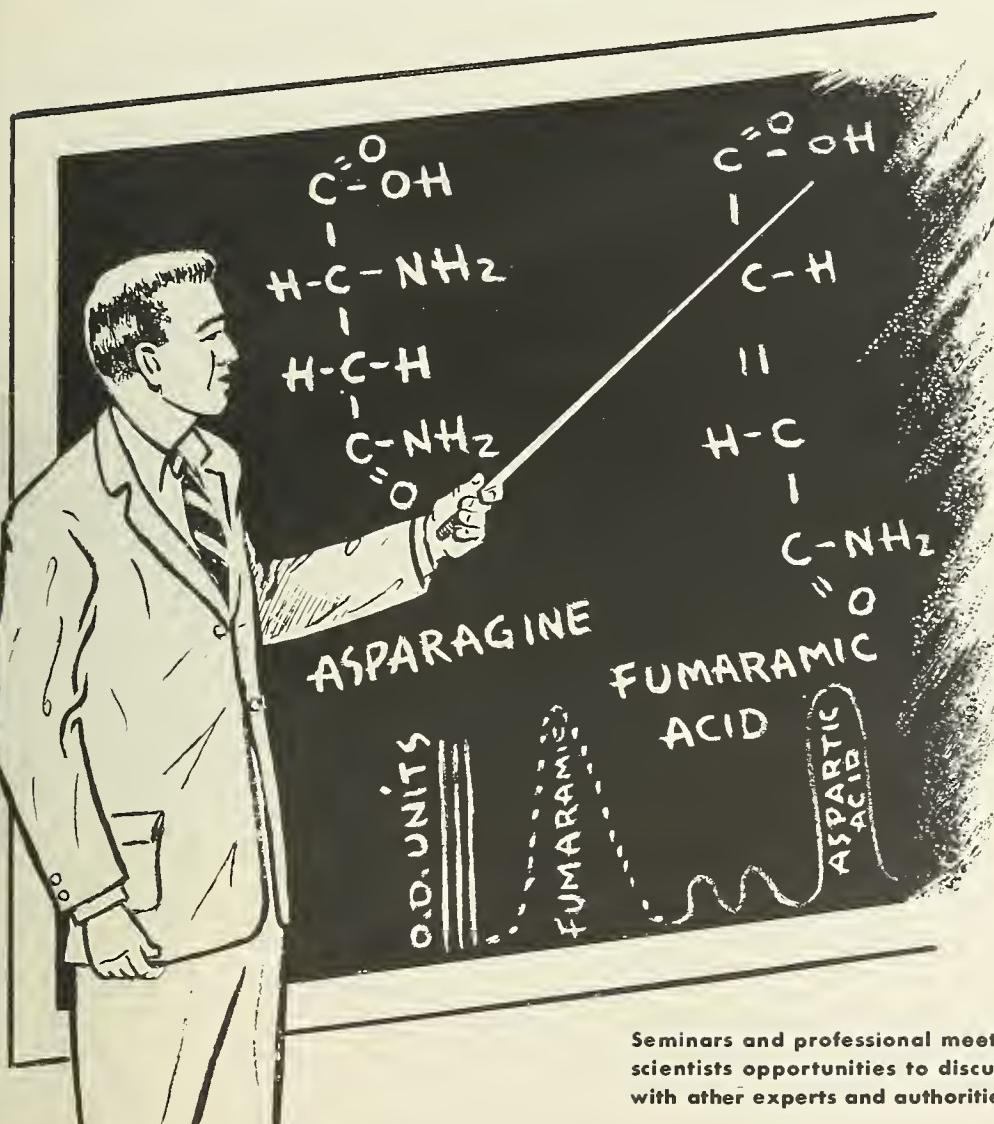


Recording X-ray diffraction unit is used to reveal the structure of plastics made from animal fats.

achievements, while employees whose general performance is outstanding are eligible for substantial cash awards. Scientific societies and foundations have honored Eastern Division scientists with such citations as the Industrial Achievement Award of the Institute of Food Technologists, the Alsop Award of the American Leather Chemists Association, Borden Awards in the Chemistry of Milk and Dairy Technology, the Bond Award of the American Oil Chemists Society, the Arthur S. Flemming Award, and the John Scott Medal Award.

### Salaries and Benefits

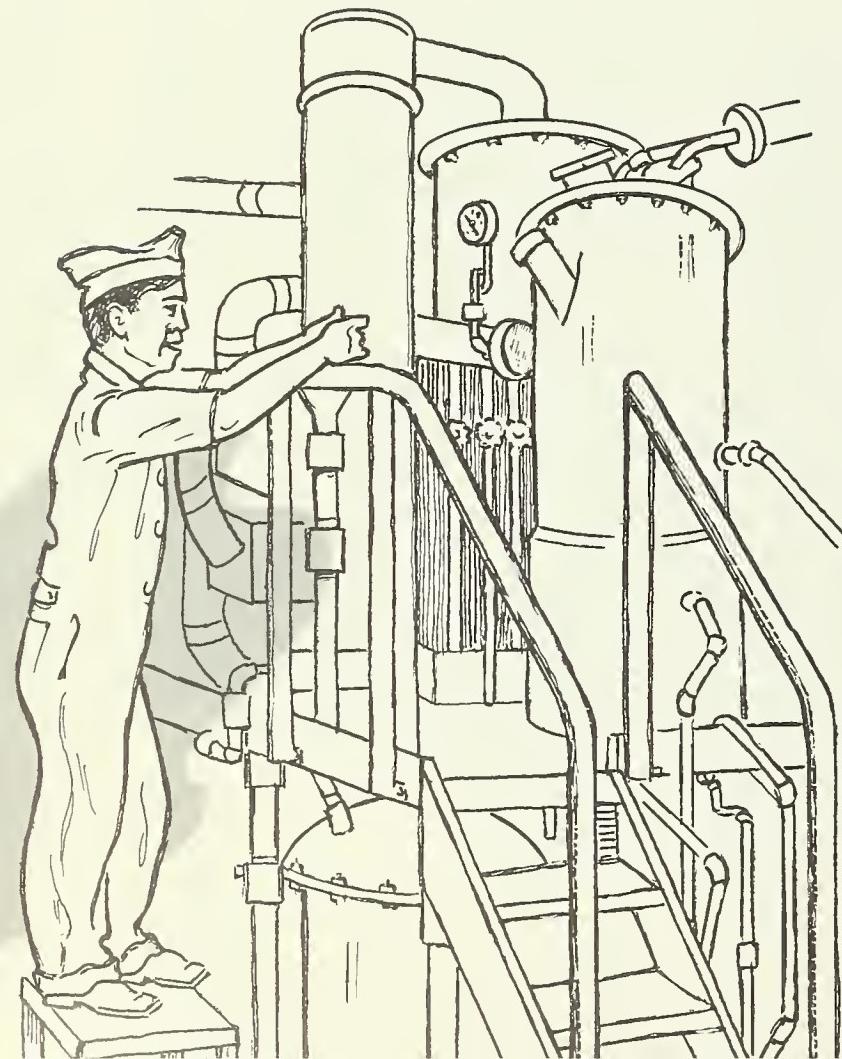
Except for a few trade-association fellowships, all positions are in the Federal Civil Service, and employees receive full Civil Service benefits. Salary scales are substantially competitive with industrial salary scales and provide unusual security and retirement benefits. Initial compensation is based on the individual's educational background, knowledge, and experience. Thereafter it depends entirely on his professional growth. The Government's health plan is one of the most liberal and forward-looking available to employees anywhere. (See also page 28.)



An ion-exchange method of removing strontium 90 from milk, developed and operated on a pilot-plant scale at Beltsville, Md., is under development for commercial adoption if required by an emergency.

# F acilities

The 400-man staff of the Eastern Utilization Research and Development Division—including about 230 professional people—has access to the finest in research facilities and the most advanced in scientific equipment. At all three locations—the large headquarters building in Wyndmoor, Pa., the laboratories in the U.S. Department of Agriculture's South Building in Washington, D.C., and the laboratories at the Department's Agricultural Research Center at Beltsville, Md.—facilities are more than adequate to meet the requirements of the present program and are growing in response to recent Congressional authorization of an expansion in utilization research.



Pilot-plant equipment for processing milk allows engineers and food technologists to experiment under plant conditions.

## Wyndmoor, Pa.

The three-story U-shaped building at Wyndmoor was especially constructed for the conduct of utilization research and development. It consists of nearly 100 interconnected laboratory suites, each providing a research work area, utility space, and a small private office for study and writing. Most of these are in the laboratory wing of the building. The other wing is almost entirely devoted to a basement-to-roof pilot plant with complete equipment for testing the practicality of research findings on a larger scale. In other parts of the air-conditioned building are shops, an auditorium, conference rooms, library, administrative offices and cafeteria.

The Wyndmoor scientists have available to them a number of outstanding instrumental facilities for fundamental research on agricultural commodities. A modern electron microscope, for example, recording spectrophotometers for the visible, infrared, and ultraviolet, and X-ray diffraction apparatus are revealing the basic properties of such materials as animal fats and hides. A wide variety of chromatographic equipment is available throughout the laboratories, including automatic amino acid analyzers now being used in the study of proteins. Further data on the fundamental characteristics of the complex milk proteins are being revealed with the aid of analytical and preparative ultracentrifuges and electrophoresis-diffusion apparatus. The precise structure of organic compounds is determined by nuclear magnetic resonance, and a thermal gravimetric balance is used for the evaluation of lubricants from animal fats. On the side of developmental research, scientists and engineers have available equipment for a wide range of unit operations so that complete pilot-plant processing studies can be carried out.

## Washington, D.C.

The work on milk proteins and dry whole milk at Wyndmoor is closely coordinated with the work of the Eastern Division's large dairy products laboratory in Washington, D.C. Here a great deal of fundamental research is done with the aid of ultracentrifuges, electrophoresis equipment, semi-automatic amino acid analyzers, ultrasonic apparatus, and radioactive tracer equipment. Another complete pilot plant is located in Washington for pasteurizing milk, and for making dairy products such as evaporated milk and butter, and various dried milks. Also at Washington is a small, well-equipped laboratory devoted to research on allergens.

## Beltsville, Md.

An important part of the dairy products laboratory is located at Beltsville, where a pilot-plant process for the removal of radionuclides from milk is being developed for possible use in an emergency.

Also at Beltsville is the meat laboratory of the Eastern Division. Here packinghouse conditions can be reproduced on a small scale. Here also are meat-curing equipment and an ultramodern stainless steel smokehouse which make possible the experimental preparation of many types of meat products. For fundamental studies of the chemistry and microbiology of meat, advanced equipment is available in the fields of photomicrography, electrophoresis, polarimetry, chromatography, spectrophotometry, and high-speed centrifugation.



Almost entire wing of the Wyndmoor building is devoted to pilot-plant experimentation.



Electron microscope, capable of magnification up to 200,000 X, is used to study the ultrastructure of the components of agricultural commodities.

C hemists . . .



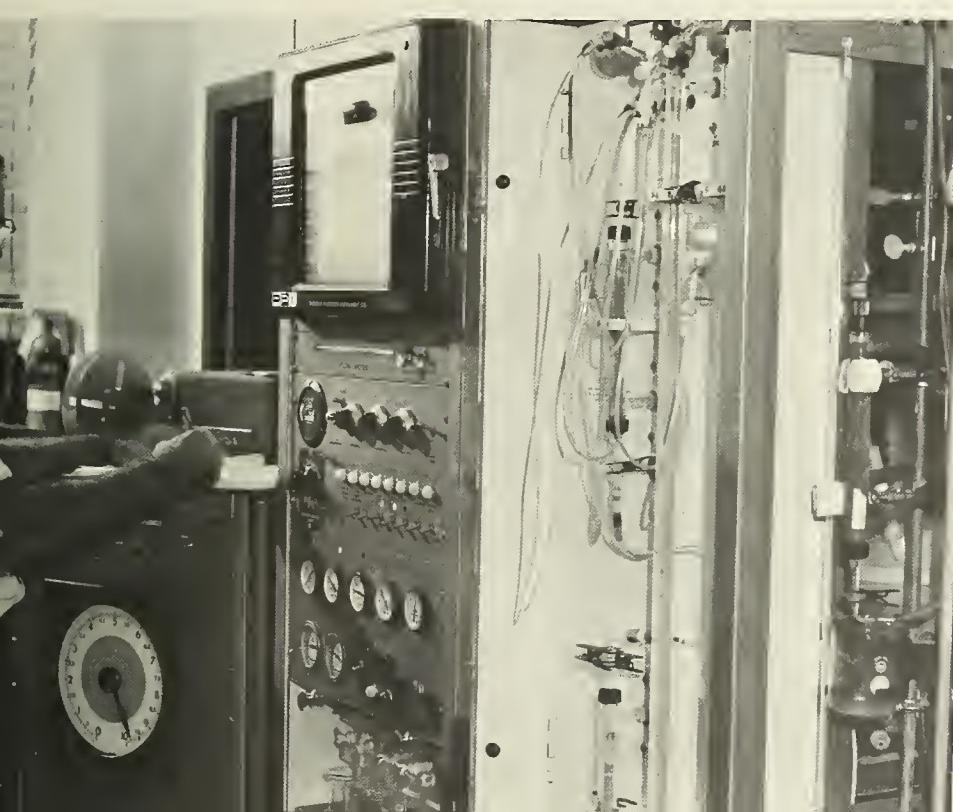
Viscosity determinations are made as part of basic research program on milk proteins.



Nuclear magnetic resonance spectrometry permits the structure of organic materials to be studied by observing the behavior of their atomic nuclei in a magnetic field.



New procedure for determining free and total acidity and lactone is used in a detailed study of the composition of honeys of different floral types.



Automatic amino acid analyzers are in constant operation for a detailed study of proteins.

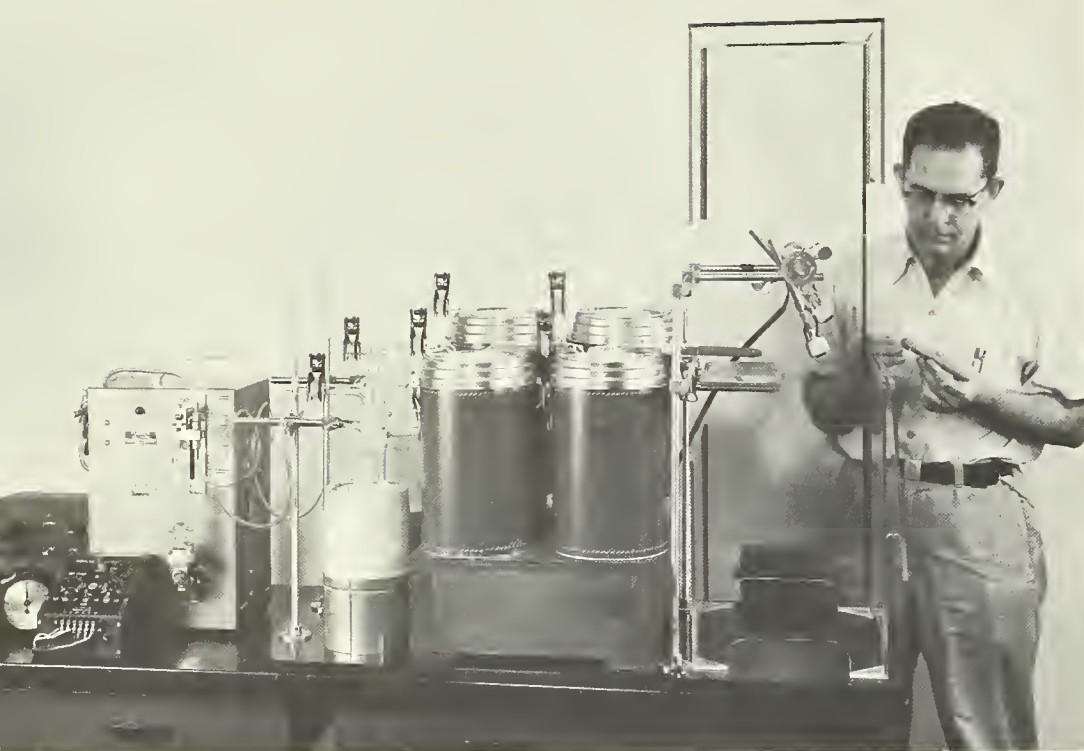
Most Eastern Division scientists are chemists. Regardless of their particular field of chemistry, they are constantly presented with exciting research challenges.

Much significant work is in progress in organic syntheses, and in the study of reactions and reaction mechanisms. Research on the formation and properties of organic monomers and polymers is a vital part of the Eastern Division's research program on fats.

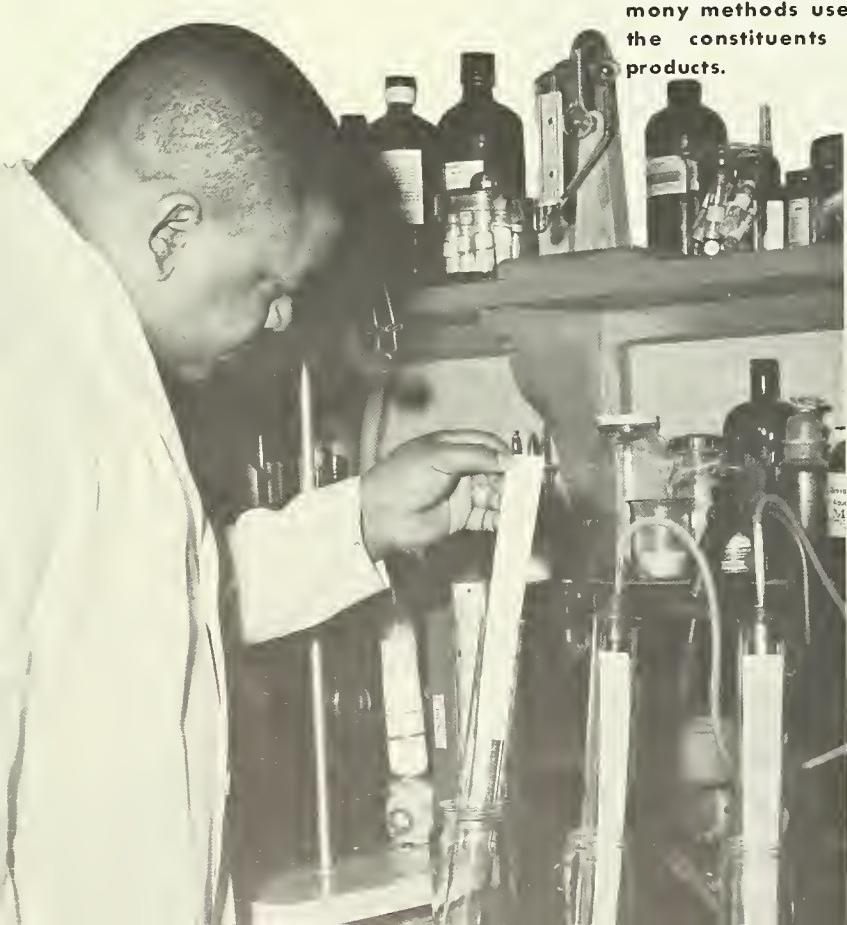
Much effort is devoted to determining the chemical composition of agricultural products. Amino acids, organic acids, sugars, pigments, and flavor components are analyzed by gas, gas-liquid, paper, and column chromatography and by other precise techniques available to the modern research scientist.

Biochemists in Eastern Division laboratories are considering such phenomena as the tenderizing of meat by aging, the biochemical changes milk undergoes in processing, and the respiration of fruits after harvesting.

Physical chemists are discovering hitherto-unknown properties of the materials that make up farm commodities by such means as X-ray diffraction, colorimetry, spectrophotometry, ultracentrifugation, and electrophoresis. New microanalytical methods and other sophisticated techniques are being applied to measure specific characteristics with an accuracy never before attainable.



Cigaret-smoking machine simulates natural puffing, collects smoke in chilled coils inside of tanks for subsequent chromatographic analysis.



Paper chromatography is one of many methods used for analysis of the constituents of agricultural products.

A few of the specific subjects of basic research underway at the Eastern Division are:

- Amino acid sequence in alpha-lactalbumin
- Location and environment of tyrosyl and tryptophyl residues by solvent perturbation
- Nuclear magnetic resonance spectroscopy of lipids and derivatives
- Submicroscopical structural forms of reconstituted collagen
- Effects of changes of interbond angles and intramolecular hydrogen bonding to pi-electrons of the double bond
- Chemical and immunological characterization of allergens
- Origin of the thermal resistance of bacterial spores
- Biochemistry of the post rigor muscle
- Small-angle X-ray scattering by macromolecules in solution
- Compositional differences among genetic variants of proteins and their relationship to the genetic code

Light absorption as shown by spectrophotometer gives clues in study of potato discoloration.



Theory of light scattering by electrolyte solutions

Relationship between amino acid composition and refractive index  
of proteins

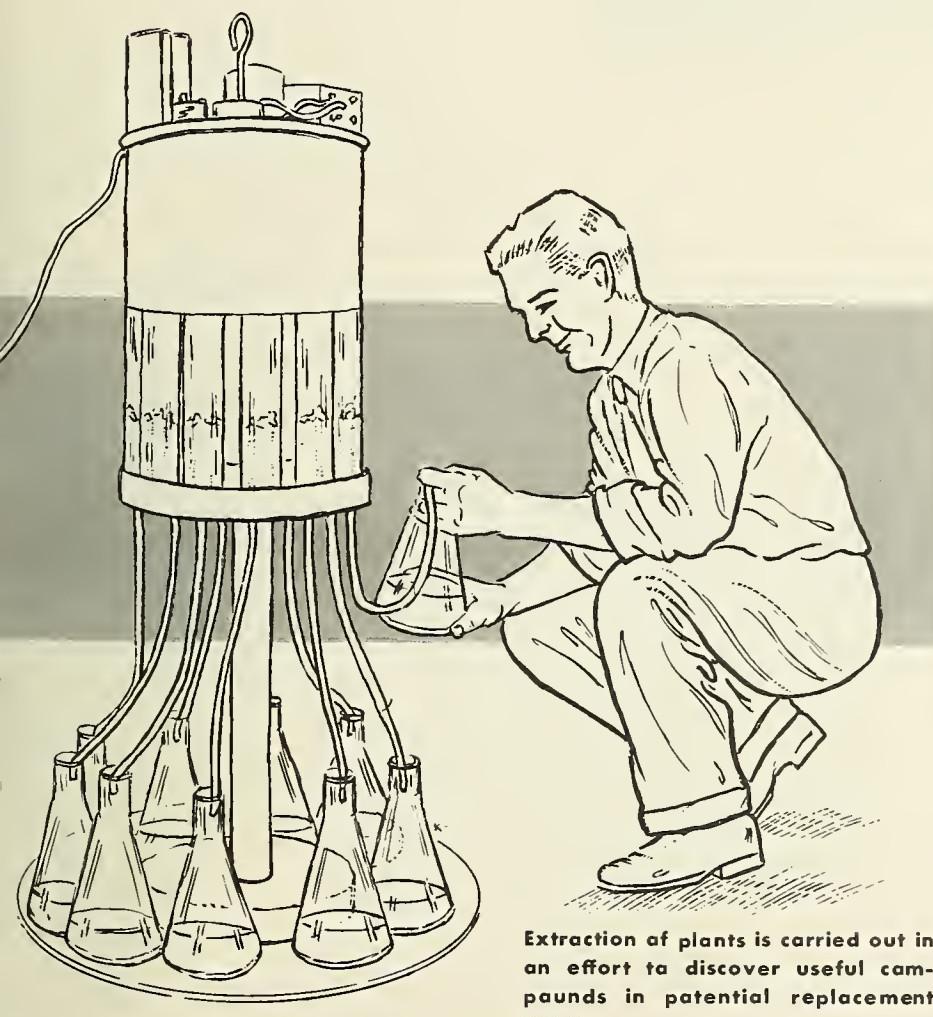
Argentation chromatography of fats

Respiration of plant tissue

Synthesis and reactions of thiiranes

Near-infrared investigation of hydrogen bonding to amide groups  
in aqueous solutions

Mechanism of acid-catalyzed isomerization in long-chain olefinic  
acids



Starch-gel electrophoresis analysis has revealed subtle differences in milk casein components that have been traced by dairy scientists to a genetic source.



## Fats in Plastics

Eastern Division chemists have opened up important new markets for inedible animal fats by discovering how they can be modified for use as components of improved plastics. Their research showed that fatty acids can be converted to excellent plasticizers by treating them with the product obtained by reacting hydrogen peroxide and acetic acid. These so-called epoxidized compounds are now being made to the extent of about 50 million pounds a year. They impart remarkable resistance to heat and light deterioration for such products as rain-coats, shower curtains, and garden hose.

Another development of this research is that of copolymers made by combining vinyl acetate or vinyl chloride with fat-derived vinyl stearate. Permanent flexibility in these copolymers is provided by the vinyl stearate, which acts as a chemically bound plasticizer. Copolymers of vinyl acetate and vinyl stearate make exterior water-base paints that give a tough, flexible film with high water resistance.

## Fats in Feeds

About a half-billion pounds of industrial-grade animal fats a year now go into prepared poultry and livestock feeds. This new outlet was established when cooperative research by scientists of the American Meat Institute Foundation and the Eastern Division demonstrated that it was both practical and advantageous to use fats stabilized with antioxidants as an energy source for these rations. The work established by feeding tests the grades of fat that should be used and the fat level for a wholesome diet, and also determined the most efficient antioxidants and the best processes for incorporating the fats into the feeds.

Since 1953, when the results of these tests were announced, the practice of adding fats to feeds has been growing. Such fat supplementation is important, since today's efficient extraction processes remove almost all of the natural oils from the meals which are the basic feed ingredients. Fats also reduce the dustiness of feeds, making feed mills safer and more comfortable places to work in.

## Glutaraldehyde Tannage

A new tanning process that adds perspiration resistance to the natural softness, durability, and beauty of leather is now being used commercially. A chemical known as glutaraldehyde, which has recently become available at reasonable cost, is used to tan this leather. Glutaraldehyde can be used alone or in combination with chrome. The resistance of glutaraldehyde-tanned leather to perspiration and other chemicals makes it ideal for shoes, especially work shoes. Skins tanned with glutaraldehyde also make beautiful garment leathers.

An estimated 10 million dollars' worth of glutaraldehyde-tanned leathers are now being produced annually. Leather manufacturers appreciate the speed with which hides and skins can be tanned with glutaraldehyde using normal tannery equipment. They also like the ease with which dyeing, oiling, and other post-tanning operations can be performed on leather produced with glutaraldehyde.

# Accomplishments

Industry today is making wide use of many products and processes developed at the Eastern Utilization Research and Development Division. Fundamental principles developed there through basic research also underlie improvements that have been made over the years in a number of food and industrial products. A few of the Division's accomplishments in applied and fundamental research are mentioned here.



### BASIC RESEARCH ACCOMPLISHMENTS

**Structure and Properties of Milk Proteins.** Milk is a fantastically complex substance containing a large number of proteins. The principal one, casein, for example, long considered a pure protein, has now been shown to consist of at least 15 different components. Eastern Division scientists have developed methods for separating and characterizing many of the proteins of milk. These methods have revealed the precise structural differences between two genetic forms in which the milk protein beta-lactoglobulin exists. A detailed study of the more than 300 amino acid residues found in this protein has shown that only 4 of its 18 amino acids have a significantly different number of residues in one of its genetic forms than in the other.

**Advances in Fat Chemistry.** In spite of the extreme complexity of fats, Eastern Division chemists have devised ways of conducting useful organic reactions on them. Fundamental studies have focused on the reactions of highly purified components of fats and their derivatives. Considerable research has been devoted to the reactions of the double bond and of the carboxyl group. Among the important double-bond reactions studied are epoxidation, carboxylation, isomerization, and the addition of phosphorus- and sulfur-containing substances. Vinylation, amidation, esterification, and polymerization are among the carboxyl group reactions investigated. Much information has been gained through the study of model systems and through the application of modern instrumental techniques.

## Fruit Flavors Captured

One of the most important engineering achievements of the Eastern Division is the development of a process for recovering the volatile aroma, or flavor, of fruit juices. When a fruit juice is evaporated, most of its flavor normally escapes along with the water. The recovery process permits this flavor to be captured as a concentrated "essence," with 100 to 1000 times the flavor strength of the original juice. By this process essence can be made from the juice of apples, grapes, cherries, strawberries, blackberries, and other fruits.

These fruit essences are now used commercially in the making of jellies and can be used in the flavoring of such food products as ice cream, candy, and carbonated beverages. Moreover, the essence-recovery process has provided the key to the production of juice concentrates and powders that make beverages just as delicious as the fresh fruit because the original flavor has been retained and no synthetics have been added.

## Potato Flakes

Today's supermarket shelves contain several brands of a phenomenally successful dehydrated mashed-potato product called potato flakes. Potato flakes were developed by Eastern Division engineers who conceived the idea that mashed potatoes could be dried so rapidly on the surface of a revolving drum that flavor would be preserved.

This completely novel approach to mashed-potato dehydration was an almost immediate success. Thirteen plants are now in operation, with a capacity of about 60 million pounds of potato flakes a year, equivalent to 6.7 million bushels of potatoes. The plants are located in most of the principal potato-growing States, including Maine, New York, Michigan, Minnesota, North Dakota, Idaho, and Oregon. Most potato varieties produced throughout the country are suitable for making excellent dehydrated mashed potatoes by the flake process.

## Quality Maple Sirup

A basic chemical study of the mechanisms by which color and flavor are developed as clear, tasteless maple sap is evaporated to sirup led Eastern Division scientists to a key discovery. This was that sap fermentation is primarily responsible for the objectionable dark color and strong flavor of low-grade sirups. Now, to control the growth of quality-destroying micro-organisms, disinfecting pellets are made for insertion into the tap-hole. Their use improves the quality of sap and increases the quantity produced by preventing premature stoppage of sap flow.

Through such research as this, the art of collecting sap and making sirup—an art as old as America itself—is becoming an exact science. Maple sirup quality is improving; ten years ago only 50 percent of the sirup produced was top grade, whereas today 80 percent of it is. The better returns these quality improvements are bringing to maple farmers everywhere are stimulating a renewed interest in the production of sap and sirup.

# C hemical E ngineers . . .

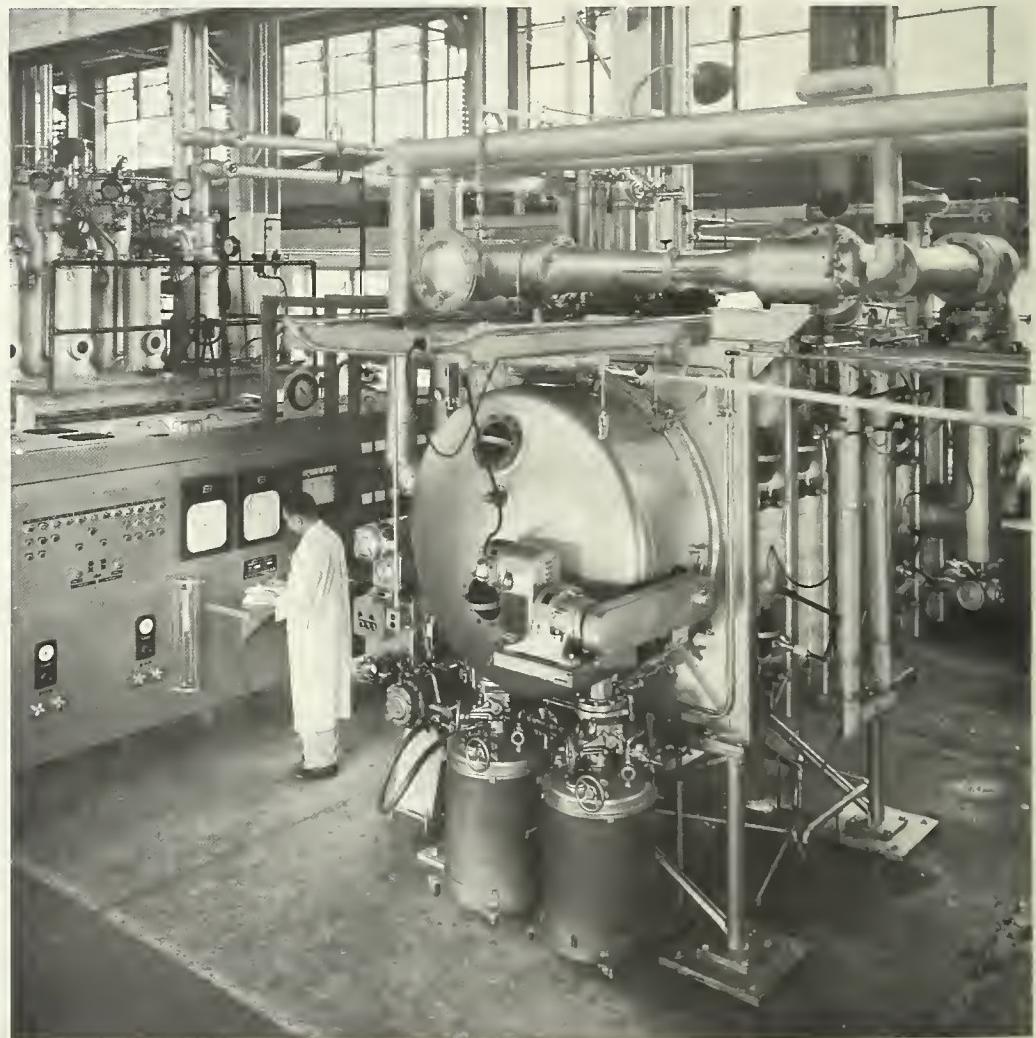
The chemical engineer plays a critical role in the operations of the Eastern Division. He investigates the commercial feasibility of an experimental process by testing it out on a pilot-plant scale. The process itself may have originated in the engineering and development laboratory where a great deal of original engineering research is done. Or it may have been worked out in one of the other research laboratories of the Division. In either case, scaling the process up for pilot-plant operation inevitably demands the highest degree of engineering skill and ingenuity.

The work of Eastern Division chemical engineers is at present largely in the field of food dehydration. Processes they have developed for the concentration of fruit juices and recovery of essence, and for the manufacture of potato flakes are now in wide commercial use. The engineers are now seeking to perfect a continuous vacuum process for drying whole milk in the form of a foam. They also have under development an explosive puffing technique for making quick-cooking dehydrated fruit and vegetable pieces for soups, stews, etc.

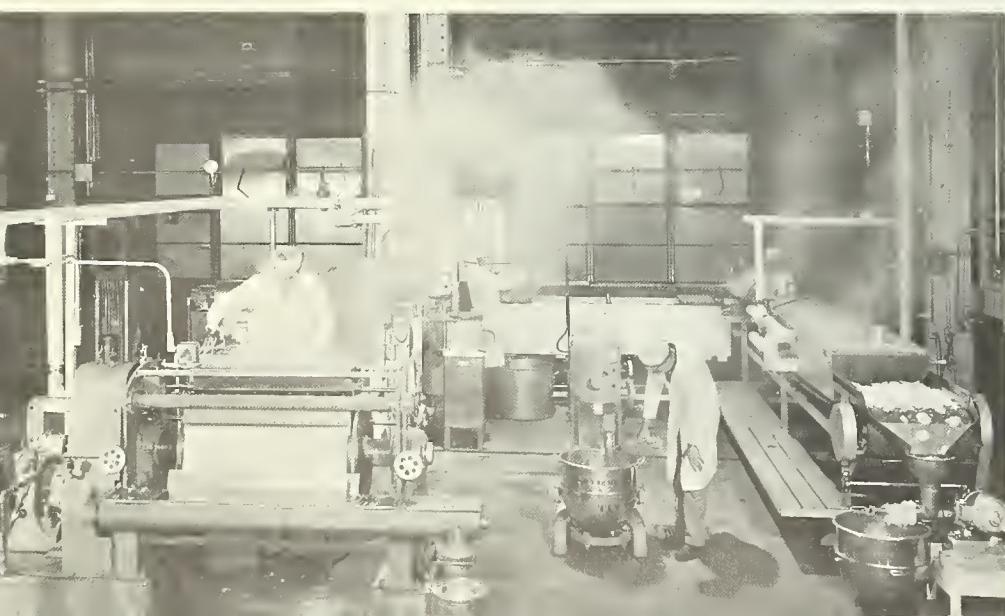
Because their work is not limited to food, but may be concerned with any of the various commodities assigned to the Division, these engineers deal with virtually every unit operation in chemical engineering. They do basic engineering research on unit operations. They study a unit operation individually as it relates to a new process, or they may have to assemble the equipment required for an entire process to be run as a continuous operation.

It is the job of the chemical engineer in utilization research to determine the type of equipment that would probably be required for large-scale operation, the materials of construction, the control of reactions, and other engineering details related to commercial operation of the

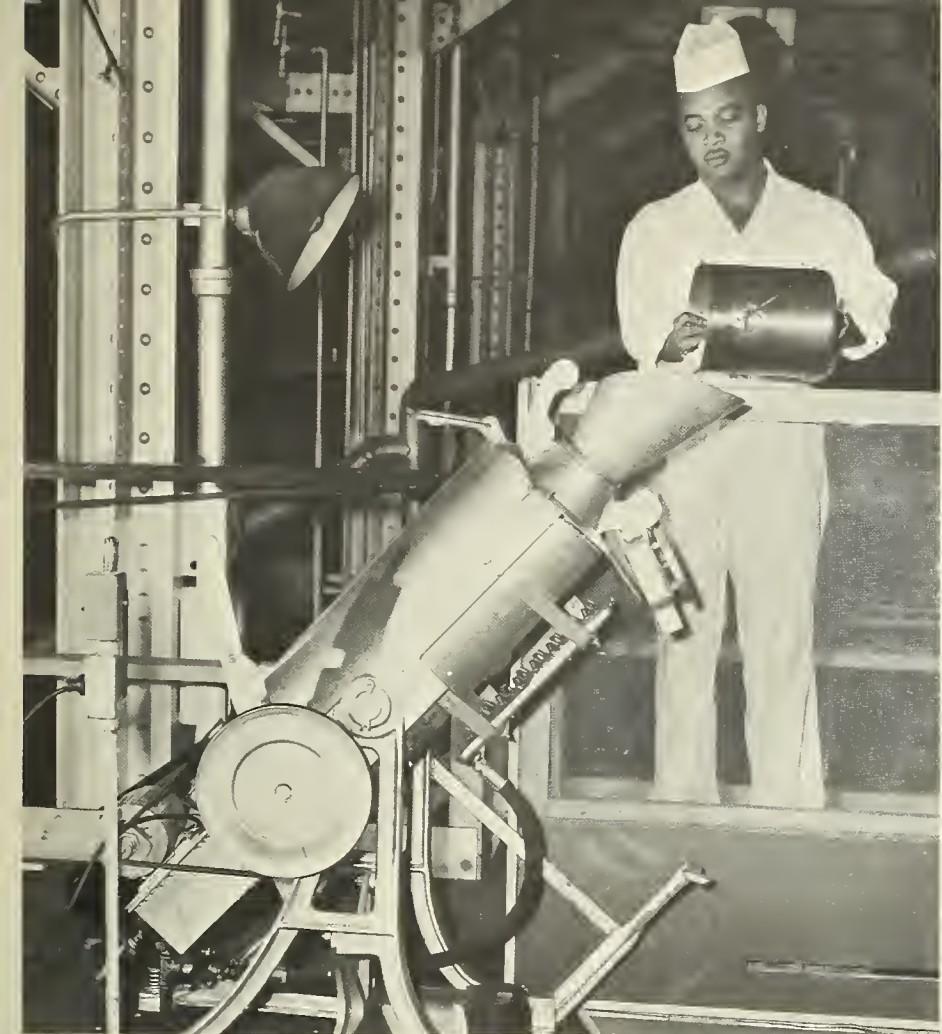
process. From this information, cost estimates for commercial production are made and functional design of equipment and plant are developed. The engineers have close contact with industry as they demonstrate new pilot-plant processes to interested manufacturers, consult with industry representatives, and assist in the initial operation of commercial plants.



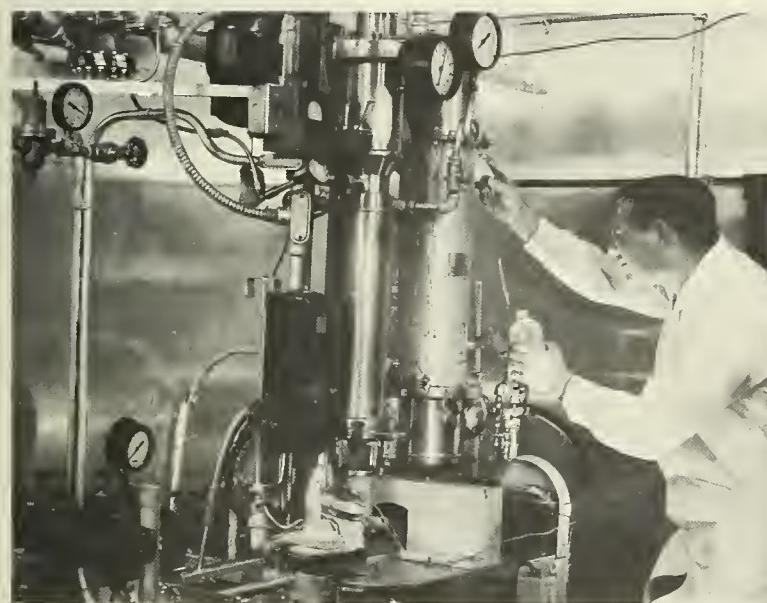
Vacuum dehydrator used in pilot-plant experiments to develop beverage-quality dry whole milk.



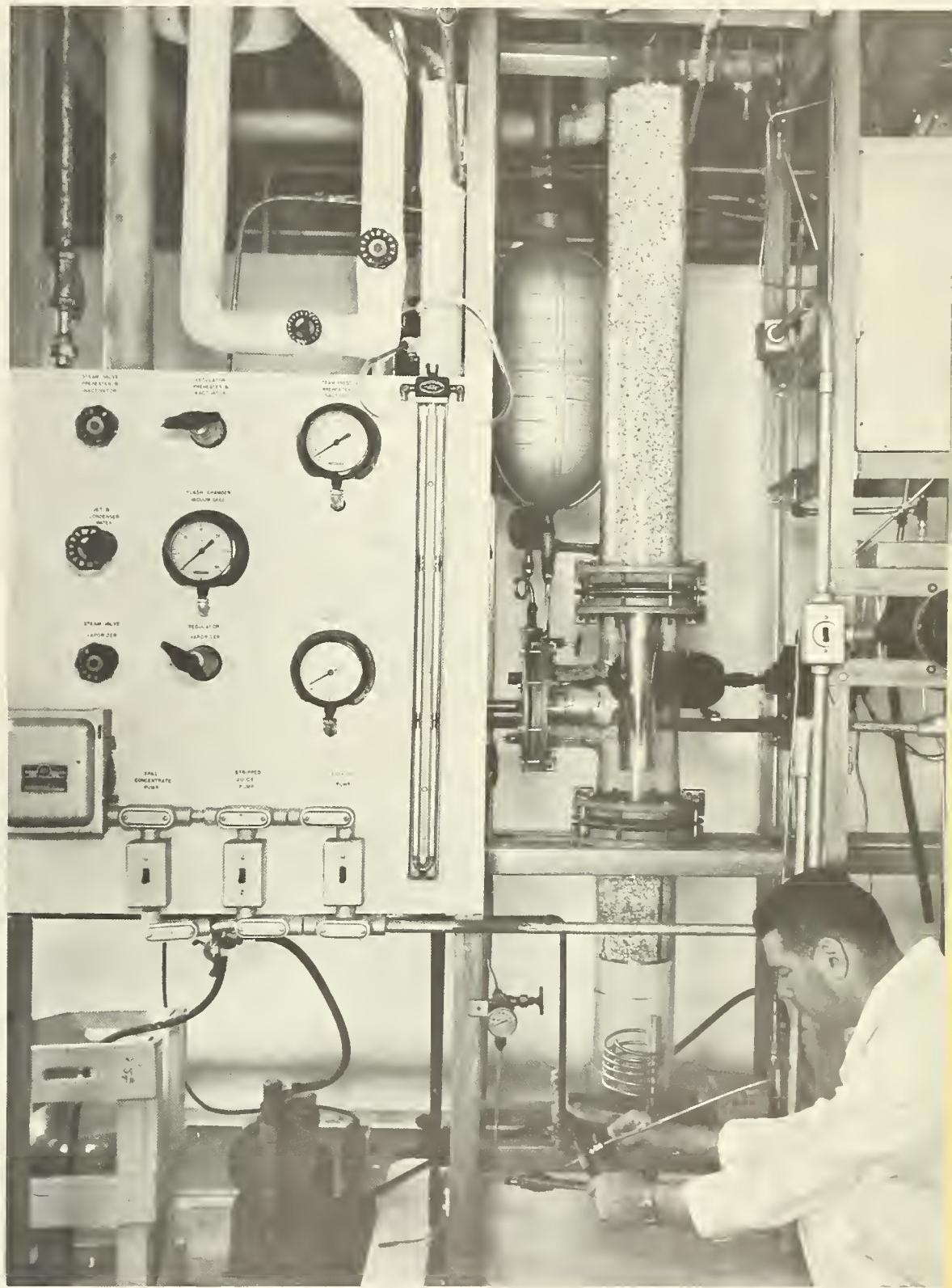
Potato flakes, now sold in supermarkets everywhere, were developed and first made on small scale in Wyndmaar pilot plant.



Explosive puffing, now in pilot-plant development, permits preparation of dehydrated fruit and vegetable pieces that will cook in 5 minutes instead of the usual half-hour.



Equipment in low-humidity chamber is used to prepare full-flavor dehydrated fruit juices and honey.



Essence is recovered from fruit juice in this apparatus for subsequent restoration to the concentrated juice to make a full-flavor product.

# Food Technologists . . .

For the food commodities assigned to the Eastern Utilization Research and Development Division—milk, meat, fruits and vegetables, maple syrup, honey—the goal of research is to develop new and improved processed products low in price and high in quality. Fundamental to this work are the knowledge, skills, and creative abilities of food technologists who understand the conditions under which foods should be processed in order to retain their flavor appeal and nutritional value. Such Eastern Division developments as potato flakes and concentrated fruit juices and juice powders owe much of their success to the work of trained food technologists.

Dairy technologists of the Eastern Division are seeking to increase the consumption of milk by improving the methods whereby it is processed, either for direct consumption as fluid, concentrated, or dried milk, or for making cheese, butter, and other dairy products. Primary considerations here are retention of flavor and nutritional value and good storage properties.

Some of this research is to stimulate a wider use of milk in the making of other food products, such as bread and baked goods. This not only provides additional outlets for recurring dairy surpluses, but in-

creases the nutritional value of the foods to which the milk is added. Other dairy technologists are working on cheese, with the purpose of stimulating cheese consumption by lowering manufacturing costs and improving quality.

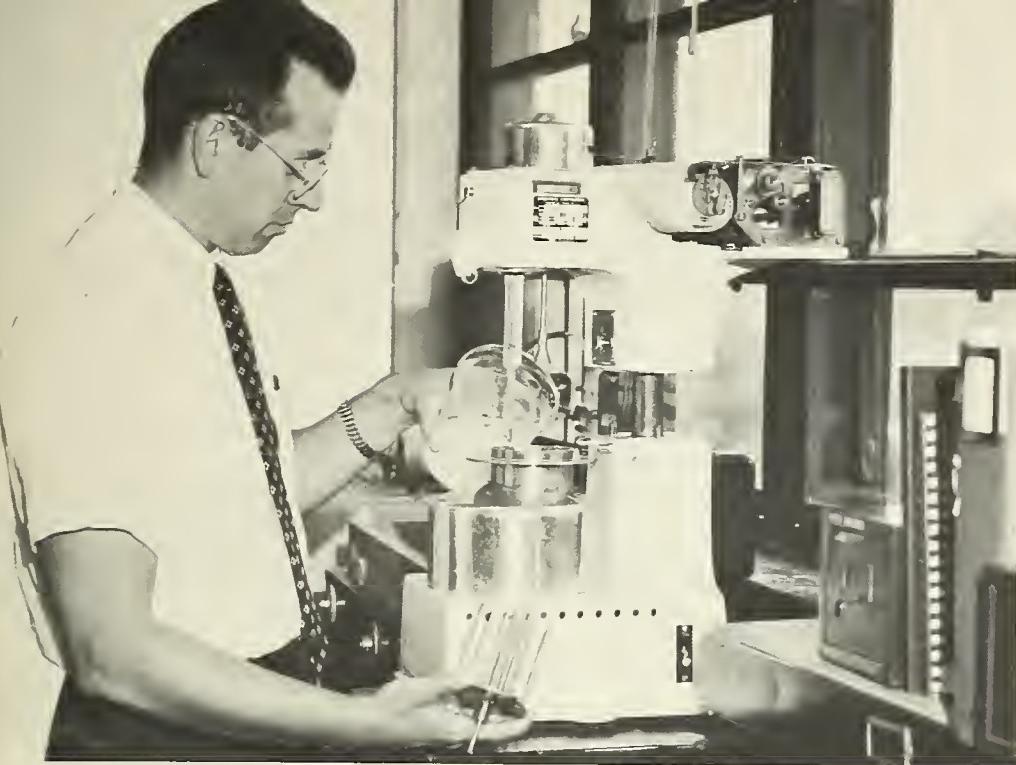
Meat technologists are studying the curing, smoking, processing, and preservation of meats, and the procedures used to make such products as sausage and frozen meat dishes. This research involves the interrelationship of several disciplines, including chemistry, microbiology, and engineering.

Since flavor is such a vital consideration in the acceptability of all foods, food technologists are much involved in the setting up of taste panels, and in the designing and evaluation of taste tests. Some background in psychology and statistics is invaluable in this work.

Our food technologists also have frequent occasion to work cooperatively with the food industry. Thus they can combine their laboratory experience with training in industrial practice. Food technologists will find wide and varied opportunities in utilization research for the exercise of their particular type of training.

Food appraisal laboratory, where products made experimentally in the pilot plant are tasted by trained panels of laboratory personnel.





Viscograph is used on potato-starch samples in study of texture and appearance of reconstituted potato flakes.

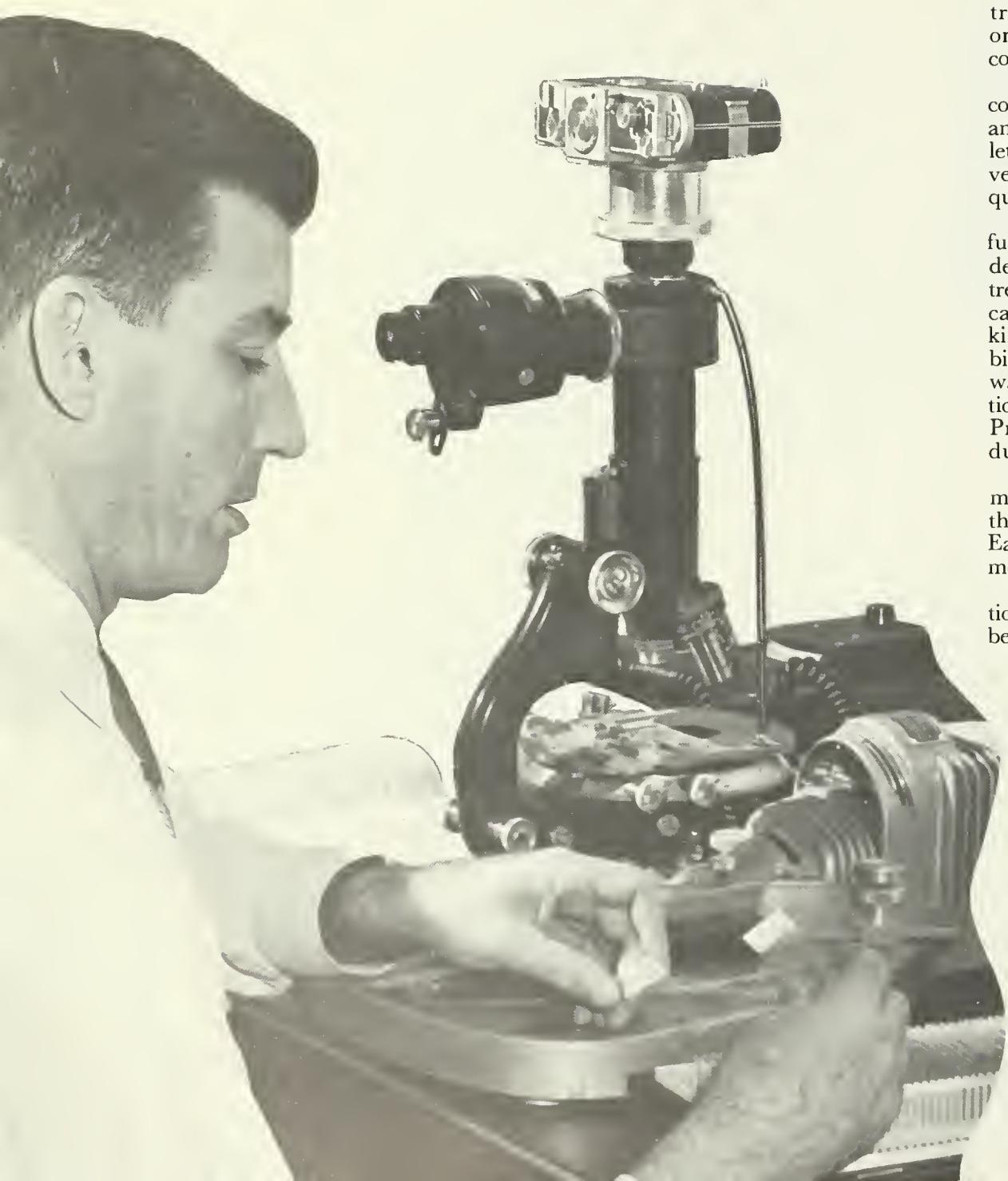


Meat from animals produced at Beltsville, Md., for research is used for analytical studies at meat laboratory there.



New and improved methods of cheese production are under investigation at Beltsville, Md., laboratory.

# Microbiologists



Although utilization research is primarily chemical research, the microbiologist plays a vital role in much of it. His special skill and training are needed, both to control the damaging effects of micro-organisms and to show how microbial processes can be put to work converting agricultural raw materials into useful products.

Research on maple sirup, for example, has shown the importance of controlling microbial growth in sap and sirup to preserve the light color and delicate flavor of top-grade sirup. As a result of this research, pellets have been developed for insertion in maple-tree tapholes which prevent such growth. The pellets not only preserve quality but increase quantity by preventing premature stoppage of sap flow.

In cheesemaking, on the other hand, micro-organisms are put to useful work. Scientists in our Washington and Beltsville laboratories, who develop new and better processes for making cheese, have perfected a treatment for cheese starter cultures that prevents the growth of a virus called bacteriophage. This disease can spoil entire cheese batches by killing the bacteria needed to convert milk to cheese. In other microbiological research in the dairy field, a process for treating milk-plant wastes so they can be discharged into streams without causing pollution is one of the outstanding accomplishments of the Eastern Division. Present research is concerned with bacteriological control in the production of dry whole milk and other milk products.

Research on leather has shown that micro-organisms can perform many useful functions for tanners. Enzymes, for example, many of them of microbial origin, can be used to remove hair from hides. Eastern Division scientists are studying these to develop a more efficient method of unhairing hides than the presently used liming processes.

In the processing of meat there are many bacteriological considerations, such as the effect of bacteria on flavor in brine curing, which are being studied by microbiologists of the meat laboratory.

**Microbiological studies of leather include microscopic analyses of hide and its modification by different tannery processes.**



Study of bacteriophage, a virus that attacks bacteria, has resulted in the development of a process to prevent its spread in cheese starter cultures.



Control of microorganism growth in maple sap and sirup has increased production and improved quality.



Laboratory unit demonstrates dairy-waste disposol method developed at Wyndmoor, Pa., in which aeration accelerates bacterial consumption of milk solids.

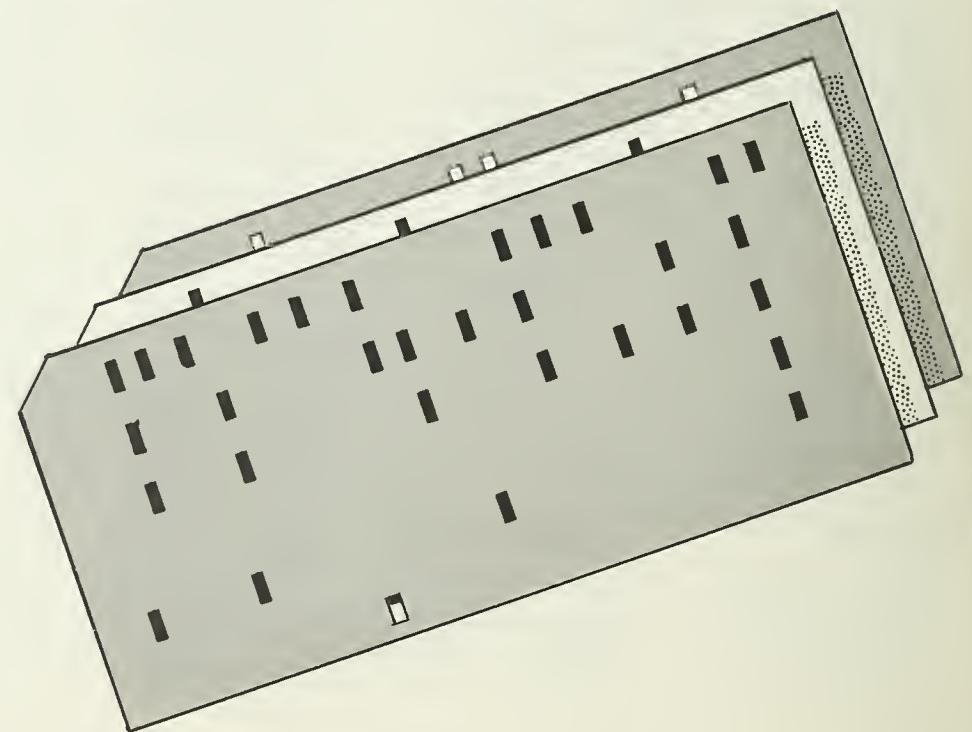
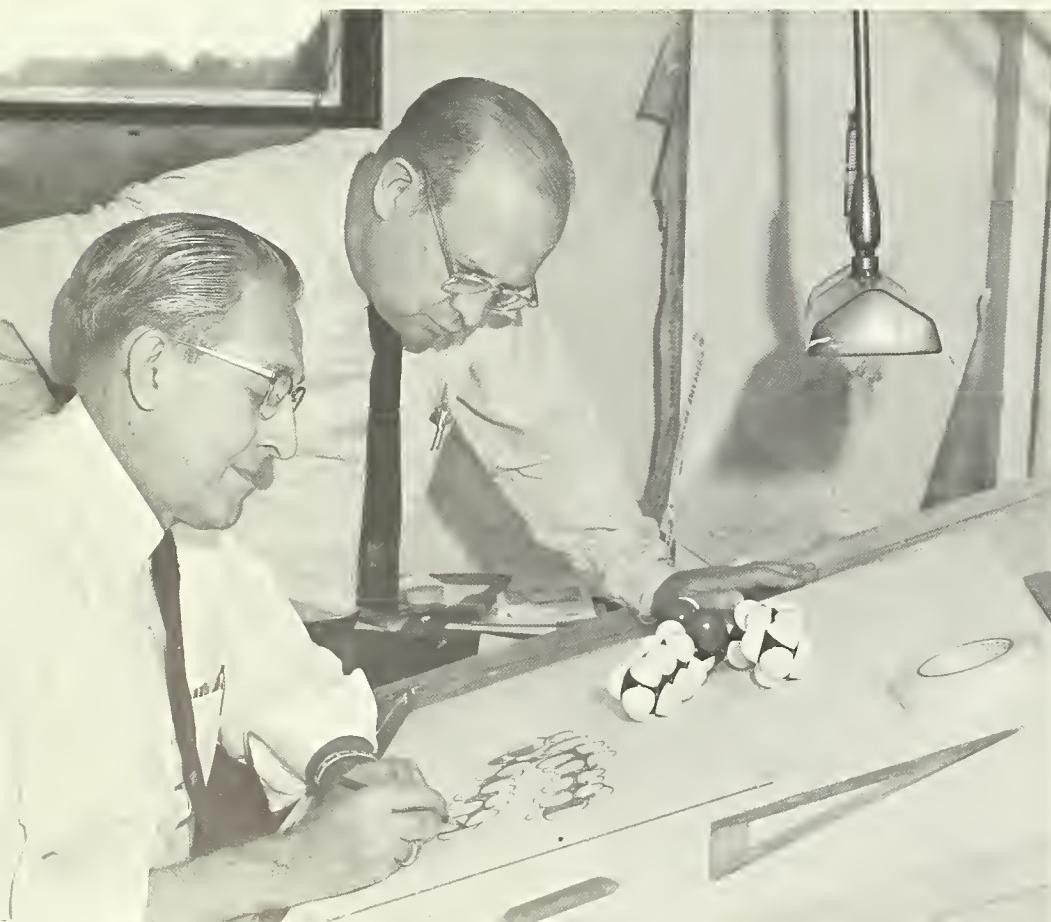


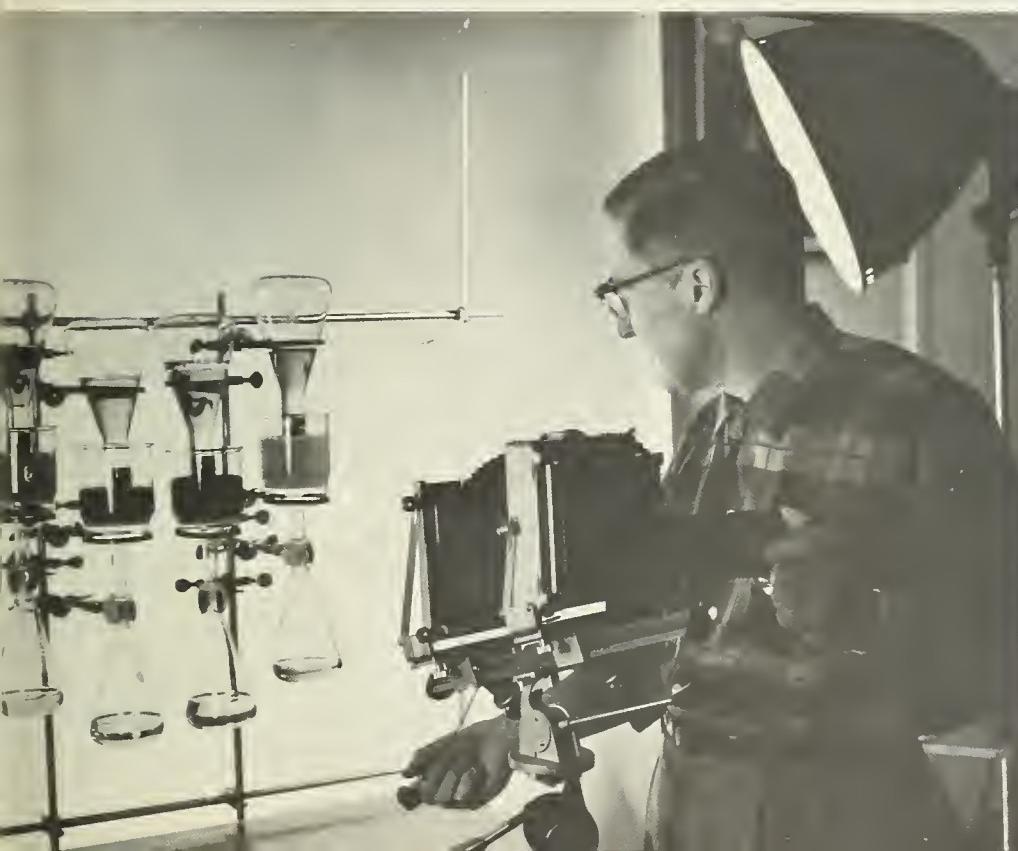
Microbiologist determines the activity of enzymes obtained from meat bacteria.

# Special Services

Modern research is a team effort, involving not only the individual scientist working on a project, but many other specialists on whom he must depend for important technical services. Productive scientific achievement is encouraged at the Eastern Division by providing a trained supporting staff equipped with the finest in up-to-date machines and supplies.

Services include those of highly skilled instrument makers and an expert glassblower who construct and maintain research apparatus in their well-equipped shops. All laboratories have access to complete technical libraries staffed by librarians who help with literature searches and arrange for loans from other libraries in the Philadelphia and Washington areas. A trained statistician and the latest computing equipment are available for machine computation of results, statistical analyses, and planning of experiments. For presentation of research results, both oral and written, scientists can call on an experienced photographer who works with the finest equipment for making technical photographs, slides, and motion pictures; an artist capable of producing intricate scientific illustrations (also the illustrator of this book) and several engineering draftsmen; and a specialist in scientific writing.





# Educational Opportunities . . .

Staff scientists who wish to continue their education have ample opportunity to do so. Many Eastern Division employees have completed work for advanced degrees by attending evening classes at one of the several universities in the Philadelphia and Washington areas. Work on official projects in the laboratory is accepted as a thesis subject in many cases. Some staff members teach evening classes in neighboring universities.

The U.S. Department of Agriculture also conducts its own Graduate School in Washington, offering opportunities for employees in our Washington and Beltsville laboratories to obtain advanced training while working in their regular positions.



Drexel Institute of Technology, Philadelphia,  
Pa.



University of Pennsylvania, Philadelphia, Pa.



LaSalle College, Philadelphia, Pa.



George Washington University, Washington, D.C.

Temple University, Philadelphia, Pa.



St. Joseph's College, Philadelphia, Pa.



University of Maryland, College Park, Md.

# SALARIES AND BENEFITS . . .

**Salaries.** Recent legislation by the Congress has provided that Civil Service salaries be made comparable with those in private employment as established by survey. This legislation has also maintained, and even strengthened, the traditional advantages of Government employment. Thus Federal service has been made unusually attractive for scientists.

The table on this page shows the entrance salaries currently being offered for most of the scientific positions open at the Eastern Division. These positions, including chemists and chemical engineers, are in a so-called "shortage category," and the starting salaries shown are anywhere from \$500 to \$1000 higher than for other Government positions in grades GS-5 through 11.

The college graduate without further experience normally enters Government service at the GS-5 grade. However, he may start at GS-7 if his college grades indicate that he is a better-than-average student. Service as a student trainee at the required level, or completion of one year of graduate study in an applicable field of science or engineering, may qualify him for a GS-7. Holders of masters' degrees are eligible at least for GS-7, and holders of doctors' degrees at least GS-11. Superior students with postgraduate degrees enter at GS-9 (masters) or GS-12 (doctors).

**Promotions and Within-Grade Salary Increases.** Research workers of the Eastern Division are afforded excellent opportunities for advancement through a fair and efficient promotion system. A scientist's performance in his job is reviewed periodically by a committee of his fellow scientists. Promotions are based solely on research accomplishments and scientific competence.

In addition, employees remaining in the same grade are eligible for "step increases" of anywhere from \$160 a year in grade GS-5 to as much as \$500 in grades GS-15 and above. Employees are eligible for these step increases every 1, 2, or 3 years, depending on the time they

have been in the grade. Additional step increases can be awarded in recognition of exceptional performance.

**Holidays and Leave.** Employees receive 8 paid holidays a year. Generous "annual leave" is granted as follows: 13 work days a year during the first 3 years of service, 20 work days during the next 12 years, and 26 work days after 15 years. This annual leave, up to 30 days of which may be accumulated, is an especially attractive feature of Government employment. It provides not only for vacations, but for time off for any personal reasons whatsoever as permitted by work schedules. All employees are allowed 13 work days a year for sick leave, and this accumulates without limit. Extended leaves of absence may be granted for study leading to an advanced degree or other special work. Military leave with pay is granted for reserve training.

**Retirement.** Career Civil Service employees have one of the finest retirement systems in the Nation. Supported equally by the employee (through payroll deductions) and the agency, the system provides for optional retirement at age 60 after 30 years of service with full annuity and at age 55 with reduced annuity. Through these annuities, employees are assured of a financially secure retirement for age or disability. Or, if an employee should die in service, the plan provides generous incomes for his surviving wife and

children (or her dependent husband and children).

**Insurance.** Employees can purchase life insurance equal to their annual salary through payroll deduction of 25 cents every 2 weeks per thousand dollars of coverage. Excellent medical and hospital plans are also available for employees and their immediate families. The Government shares with the employees the cost of this insurance coverage.

**Other Benefits.** Active credit unions serve all our laboratories. Compensation is available for job-connected injuries. A Government-wide suggestion program is in force whereby cash prizes up to \$25,000 can be paid for money-saving ideas.

Starting Salaries for Scientific Positions  
in Shortage Category

Grade	Yearly Salary		
	Present	Jan. 1964	
GS-5.....	5,525	\$5,365	\$5,490 5,650
GS-7.....	6,650	16,415	16,770 6,965
GS-9.....	7,125	7,490	
GS-11.....	8,575	8,970	
GS-12.....	9,475	9,980	
GS-13.....	11,150	11,725	
GS-14.....	12,845	13,615	
GS-15.....	14,565	15,665	

# R ecreation . . .



Many nearby golf courses



Bowling teams



Army-Navy game, Philadelphia Stadium



Phillies game at Connie Mack Stadium, Philadelphia



Tennis courts on Wyndmoor laboratory grounds



Annual picnic on Wyndmoor laboratory grounds

# P hiladelphia . . .



Philadelphia is a city rich in tradition, alive with industry and commerce, and devoted to the arts and sciences. For those who like to live and work outside a bustling city, but near enough to enjoy its cultural advantages, Philadelphia's northwest suburbs, in and near Wyndmoor, provide gracious homes in a wide price range. Those who prefer the sophistication of urban living will find the city's modern apartments and fine homes within easy commuting distance of the Wyndmoor laboratories.



A suburban street near the laboratories



A free summer concert at Robin Hood Dell



The Philadelphia Museum of Art

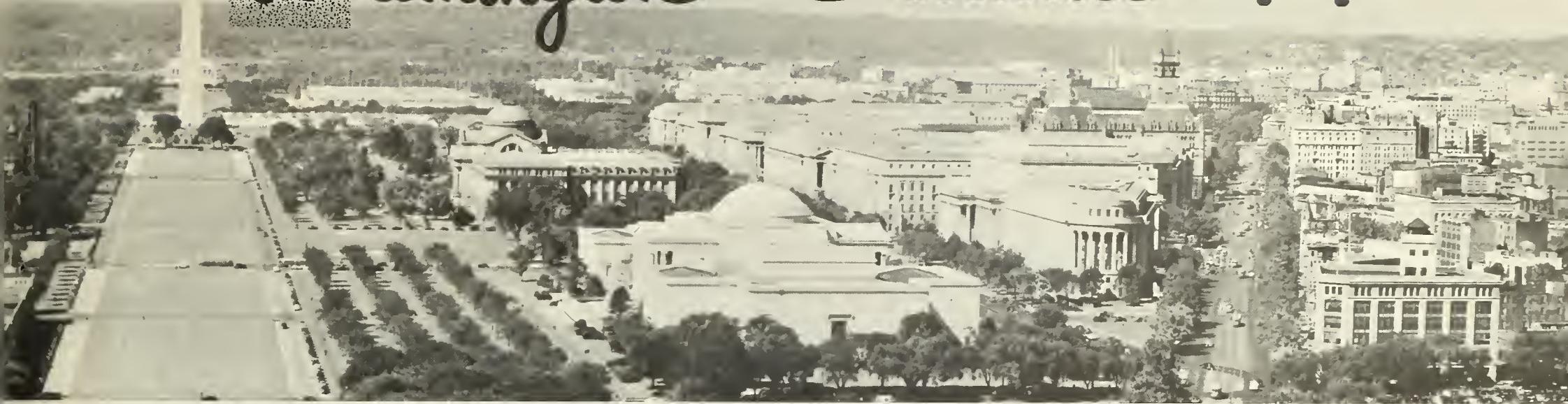


Independence Hall and Mall



The Franklin Institute

# Washington - Beltsville



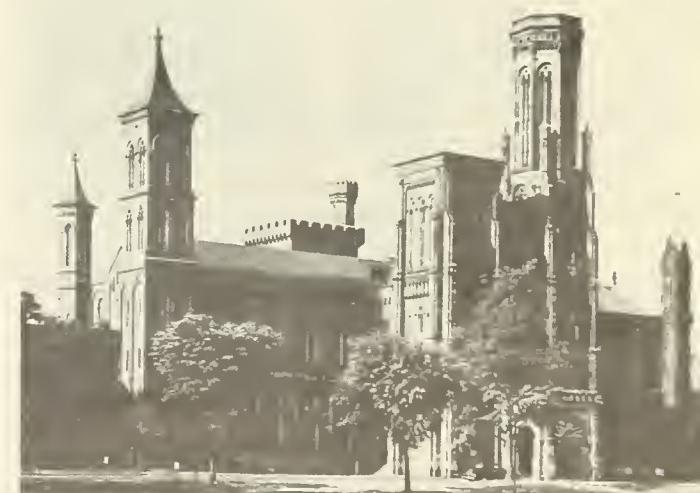
The Jefferson Memorial



The National Gallery of Art



The Nation's Capitol



The Smithsonian Institution

Washington, D.C., is one of America's cleanest, most cosmopolitan, most exciting cities. This center of the Nation's political life is also a cultural and educational center. The rolling hills of Maryland and Virginia, across the waters of the historic Potomac, offer a wide variety of suburban living convenient not only to the U.S. Department of Agriculture's South Building in southwest Washington, but also to Beltsville, Md., 15 miles north of the city, where our other laboratories are located.

# How to Apply . . .



If some phase of our research program interests you, and you would like to be considered for one of the challenging positions open at the Eastern Division, write to us today. Include as much information as you can about your interests, your college and related extracurricular activities, and your grades.

Address your letter to:

Dr. P. A. Wells, Director  
Eastern Utilization Research and Development Division  
Agricultural Research Service  
U.S. Department of Agriculture  
600 E. Mermaid Lane  
Philadelphia, Pa., 19118

(Issued September 1963)



New York

Northeast Ext.  
Pennsylvania

Pennsylvania



Maryland

Baltimore



B & W PKY

Beltsville

Washington D.C.



Delaware

Fort  
Washington

Philadelphia

Turnpike

New  
Jersey

